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Biofilm Formation in a Permanent Tracheal Stent Implanted for Twenty-Five Years

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At the age of 3, our patient required a tracheostomy (metal cannula) after a tracheal injury following accidental aspiration of sulfuric acid, leading to central airway stenosis. At the age of 16, recurrent pulmonary infections led to the insertion of a tracheal silicone stent (Montgomery T-tube). Despite daily doses of inhaled antibiotics (colistin and tobramycin), airway clearance suctioning, and intermittent systemic antibiotic treatments to prevent and treat pulmonary infections, severe bronchiectasis with lung function decline occurred (FEV1, 1.37 liter; 35% predicted), and the patient was referred for lung transplant evaluation. To decrease the frequency of pulmonary infections, the stent was finally replaced at the age of 42 after the patient had refused replacement sev-

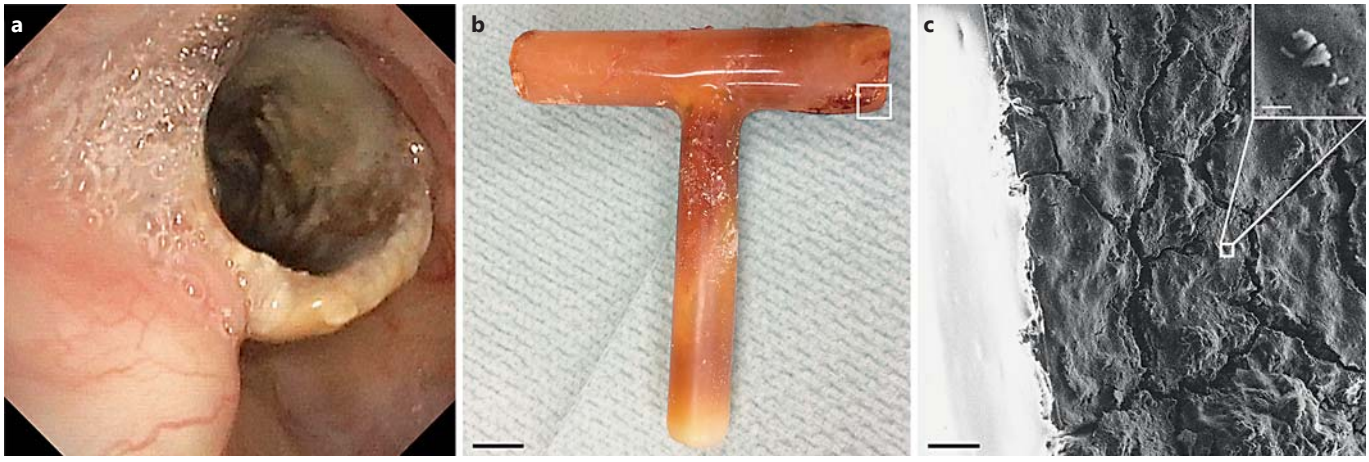

Fig. 1. a Endoscopic view of the proximal stent end in the subglottic region. **b** Macroscopic overview of the explanted Montgomery T-tube stent 25 years after insertion for tracheal stenosis in a teenager. **c** Visualization of a polymicrobial biofilm on the inner surface of the stent by using a Zeiss Supra 55VP field emission scanning electron microscope (Center for Microscopy and Image Analysis, University of Zurich, Zurich, Switzerland). For imaging, a piece of the stent was cut out (**inset** in **b**; scale bar: 1 cm), showing a thick biomass (**c**; scale bar: 100 μm) and different shapes of bacteria, indicating a polymicrobial infection (**inset** in **c**; scale bar: 2 μm).

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eral times. The removed stent was intact but discolored and covered by a biofilm (fig. 1a, b) [1]. *Stenotrophomonas maltophilia* (moderate growth), *Corynebacterium amycolatum* (strong growth), *Candida albicans* (moderate growth), coagulase-negative staphylococci and anaerobes (in broth) were cultured from the stent. Both *Stenotrophomonas maltophilia* and *Corynebacterium amycolatum* had been previously isolated during bronchoscopy examination. Scanning electron microscopy (SEM) of the explanted stent showed rod-shaped bacteria embedded in a thick biofilm structure (fig. 1c), compatible with the isolated bacteria (fig. 1c, inset).

For short-term use of endotracheal tubes, biofilm formation contributes to ventilator-associated pneumonia and recalcitrance of antibiotic treatment [2, 3]. Silver-coating tubes may be a promising strategy to reduce the number of adhering bacteria [4]. There are no reports on long-term stenting exceeding more than 1 decade or, as in our patient, for 25 years. The isolation of different bacteria on the inside of the stent with visualization by scanning electron microscopy suggests biofilm formation as the source of recurrent tracheobronchial infections.

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